

Penn Cambria Curriculum

Course Name	Honors Keystone Algebra I
Length of Course	1 credit – 1 period per day in 18 week block schedule (1.05 GPA weight)
Grade Level	9
Prerequisites	93% or higher in Middle School Algebra course
Course Description	<p>This is a more rigorous course that includes the same units and content as Keystone Algebra 1. However, this course will involve a more in-depth study of the content including a heavy emphasis on problem solving, application, and extension activities. Honors Algebra 1 provides students with a solid foundation in algebraic skills. This course is a formal exploration of math that emphasizes physical models, graphs, and other mathematical representations.</p> <p>**This course will prepare students to take the Keystone Algebra 1 assessment</p>
Units of Study	<p>Introduction to Algebra Operations with Real Numbers and Expressions Linear Equations Coordinate Geometry Linear Inequalities Polynomials and Factoring Data Analysis</p>
Materials	<p>Text: <u>Larson Algebra 1</u> – Larson, Boswell, Kanold, Stiff- Holt McDougal c2011</p> <p>Supplemental Materials: Scientific calculator; Dolcani Algebra text</p>

Unit 1: Introduction to Algebra

Estimated Time: 6 Days

Standard Alignment:

- 2.1.11. A – Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.2.11. A – Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.
- 2.5.11. B – Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.
- 2.5.11. C – Present mathematical procedures and results clearly, systematically, succinctly and correctly.
- 2.8.11. D – Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.
- 2.8.11. O – Determine the domain and range of a relation, given a graph or set of ordered pairs.
- 2.8.11. Q – Represent functional relationships in tables, charts and graphs.

Curricular Objectives:

A. Expressions:

- a. Evaluate expressions
- b. Apply the order of operations
- c. Write expressions

B. Equations/Inequalities:

- a. Write equations/inequalities
- b. Translate word problems to equations/inequalities

C. Functions:

- a. Represent functions as rules
- b. Represent functions as tables
- c. Represent functions as graphs
- d. Given a function (as a table, list of ordered pairs, etc.) identify the domain and range
- e. Given a set of values (as a tables, list of ordered pairs, etc.) determine if it is a function

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Cooperative projects representing real-world situations as functions
- Peer Tutoring

Unit 2: Operations with Real Numbers and Expressions

Estimated Time: 9 Days

Standard Alignment:

- 2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.2.11.B – Use estimation to solve problems for which an exact answer is not needed.
- 2.5.11.B – Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.
- 2.5.11.C - Present mathematical procedures and results clearly, systematically, succinctly and correctly.

Curricular Objectives:

A. Basic Operations on Real Numbers

- a. Add real numbers
- b. Subtract real numbers
- c. Multiply real numbers
- d. Divide real numbers

B. Distributive Property

- a. Evaluate expressions using the distributive property.

C. Square Roots

- a. Evaluate/approximate square roots
- b. Simplify square roots
- c. Approximate irrational numbers
- d. Compare real numbers (rational and irrational numbers)
- e. Evaluate/simplify imaginary numbers

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Homework exercises
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Computer assisted instruction

Unit 3: Linear Equations

Estimated Time: 16 Days

Standard Alignment:

- 2.1.11.A – Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.2.11.A – Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.
- 2.4.11.A – Use direct proofs, indirect proofs or proof by contradiction to validate conjectures.
- 2.4.11.B – Construct valid arguments from stated facts.
- 2.8.11.D – Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.
- 2.8.11.F – Identify whether systems of equations and inequalities are consistent or inconsistent.
- 2.8.11.G – Analyze and explain systems of equations, systems of inequalities and matrices.
- 2.8.11.Q – Represent functional relationships in tables, charts and graphs.

Curricular Objectives:

A. Solving Equations

- a. Solve one-step equations
- b. Solve two-step equations
- c. Solve multi-step equations

B. Transforming equations

- a. Solve equations with variables on both sides.

C. Algebraic Properties

- a. State the algebraic properties of equality
- b. Justify each step in the equation-solving process with the appropriate property

D. Problem solving

- a. Represent a problem situation as a linear equation
- b. Solve problem situations using linear equations

E. Systems of Equations

- a. Solve systems using substitution
- b. Solve systems using adding and subtracting (including multiplying first)
- c. Solve systems involving three variables
- d. Solve problem situations using systems of equations

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Open-ended responses
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Peer Tutoring
- Discovery lesson to introduce the solving of a system of equations
- Demonstration of solving equations using manipulative
- Real-world problem-solving project involving linear equations
- Computer assisted instruction

Unit 4: Coordinate Geometry

Estimated Time: 20 Days

Standard Alignment:

- 2.2.11.C – Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.
- 2.2.11.F – Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.
- 2.4.11.E – Demonstrate mathematical solutions to problems (e.g., in the physical sciences).
- 2.5.11.B – Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.
- 2.6.11.C – Determine the regression equation of best fit (e.g., linear, quadratic, exponential).
- 2.6.11.D – Make predictions using interpolation, extrapolation, regression and estimation using technology to verify them.
- 2.8.11.A – Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
- 2.8.11.E – Use equations to represent curves (e.g., lines, circles, ellipses, parabolas, hyperbolas).
- 2.8.11.F – Identify whether systems of equations and inequalities are consistent or inconsistent.
- 2.8.11.H – Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets and other software.
- 2.8.11.I – Use matrices to organize and manipulate data, including matrix addition, subtraction, multiplication and scalar multiplication.
- 2.8.11.K – Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y- intercepts, graphing by transformations and the use of a graphing calculator.
- 2.8.11.L – Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.
- 2.8.11.M – Given a set of data points, write an equation for a line of best fit.
- 2.8.11.O – Determine the domain and range of a relation, given a graph or set of ordered pairs.

Curricular Objectives:

A. The Coordinate Plane

- a. Plot points on a coordinate plane
- b. Graph linear equations by plotting points
- c. Identify the intercepts of the graph of a linear equation

B. Slope

- a. Find slope given two points
- b. Find slope given the graph of an equation
- c. Interpret slope as a rate of change
- d. Solve problems involving linear rate of change

C. Graphs of Linear Equations

- a. Determine the slope and y-intercept given a linear equation
- b. Determine the slope and y-intercept given the graph of a line
- c. Graph a linear equation by writing it in the form $y = mx + b$ and using the slope and y-intercept
- d. Graph a system of linear equations
- e. Solve problems involving linear equations and systems of equations
- f. Identify the graphs of higher-order equations

D. Writing Linear Equations

- a. Write a linear equation given the graph of a line
- b. Write a linear equation given the slope and a point on the line
- c. Write a linear equation given two points on the line

E. Line of Best Fit

- a. Draw a scatter plot to model a set of data
- b. Identify the line of best given a scatter plot
- c. Write the equation of the line of best fit given a scatter plot

- d. Solve problems using a regression line

F. Functions

- a. Write a linear equation as a function
- b. Determine the domain and range of a function given its graph
- c. Determine if a given graph is a function

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Open- ended responses
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Project-based learning
- Peer tutoring
- Computer assisted instruction
- Computer animation lesson demonstrating the graphing of equations

Unit 5: Linear Inequalities

Estimated Time: 12 Days

Standard Alignment:

- 2.5.11.D – Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.
- 2.8.11.A - Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
- 2.8.11.D - Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.
- 2.8.11.F – Identify whether systems of equations and inequalities are consistent or inconsistent.
- 2.8.11.G – Analyze and explain systems of equations, systems of inequalities and matrices.
- 2.8.11.H – Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets and other software.
- 2.8.11.I - Use matrices to organize and manipulate data, including matrix addition, subtraction, multiplication and scalar multiplication.

Curricular Objectives:

A. Solving and Graphing Inequalities

- a. Solve inequalities using addition and subtraction
- b. Solve inequalities using multiplication and division
- c. Graph the solution set of a linear inequality on a number line
- d. Write a linear inequality given the graph on a number line

B. Solving and Graphing Compound Inequalities

- a. Solve and graph conjunctions
- b. Solve and graph disjunctions
- c. Solve and graph absolute value inequalities
- d. Interpret solutions to problem solving situations using inequalities

C. Solving and Graphing Linear Inequalities

- a. Graph linear inequalities in two variables
- b. Graph a system of linear inequalities
- c. Solve a system of linear inequalities using graphing
- d. Interpret solutions to problem solving situations using linear inequalities
- e. Interpret solutions to problem solving situations using quadratic inequalities

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Open- ended responses
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Computer assisted instruction
- Peer tutoring

Unit 6: Polynomials and Factoring

Estimated Time: 16 Days

Standard Alignment:

2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

2.5.11.A – Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.

2.5.11.B - Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

Curricular Objectives:

A. Exponents

- a. Simplify expressions using the laws of exponents
- b. Simplify expressions involving zero and negative exponents

B. Greatest Common Factor / Least Common Multiple

- a. Find the GCF for sets of monomials
- b. Find the LCM for sets of monomials

C. Polynomials

- a. Add and subtract polynomials
- b. Multiply polynomials

D. Factoring

- a. Factor polynomials with common factors
- b. Factor polynomials using the difference of squares
- c. Factor trinomials of the form $ax^2 + bx + c$ where a is equal to 1
- d. Factor trinomials of the form $ax^2 + bx + c$ where a is greater than 1

E. Rational Algebraic Expressions

- a. Simplify/reduce a rational algebraic expression

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Homework exercises
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Computer assisted instruction
- Lecture
- Drill and practice
- Factoring demonstration using “algebra tiles” manipulative
- Discovery learning activity as an introduction to the laws of exponents

Unit 7: Data Analysis

Estimated Time: 11 Days

Standard Alignment:

- 2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.2.11.A - Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.
- 2.6.11.B – Use appropriate technology to organize and analyze data taken from the local community.
- 2.6.11.C - Determine the regression equation of best fit (e.g., linear, quadratic, exponential).
- 2.6.11.D - Make predictions using interpolation, extrapolation, regression and estimation using technology to verify them.
- 2.6.11.F – Determine the degree of dependence of two quantities specified by a two-way table.
- 2.7.11.A – Compare odds and probability.

Curricular Objectives:

A. Probability

- a. Find probabilities for compound events
- b. Represent probabilities as fractions, decimals, and percents

B. Data Displays

- a. Find the mean, median, and mode of a set of data
- b. Analyze and make predictions based on given circle, line, and bar graphs
- c. Analyze and make predictions based on box-and-whisker plots, stem-and-leaf plots, scatter plots, and other representations of data
- d. Analyze and make predictions based on the equation and graph of a line of best fit

C. Measures of Dispersion

- a. Calculate the range, quartiles, and inter-quartile range of a set of data
- b. Interpret the range, quartiles, and inter-quartile range of a set of data

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Open- ended responses
- Application exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill and practice
- Computer assisted instruction
- Project-based learning
- Class discussion of real-world applications
- Regression Line project based on real-world data